



A drought-resistant crop for our biofuel future

By MELISSA LAMBERTON, Leopold Center graduate research assistant

Envision Iowa's landscape covered with a crop that produces sustainable biofuel feedstock, strengthens the soil and protects water quality. Best of all, this crop can withstand a climate upheaval, creating its own defense against drought.

A Leopold Center grant project led by Robert Horton, ISU Agronomy, and Thomas Sauer, ARS-National Laboratory for Agriculture and the Environment, demonstrates how reconstructed native prairies might provide an ideal crop for biofuel feedstock in the future. The project expands ongoing ISU research at the Comparison of Biofuel Systems (COBS)

site in Boone County.

Iowa is famous for its organic-rich soils. Land use that puts millions of acres under annual row crops has resulted in eroded topsoil and poor soil quality. "The soils have less ability to hold plant-available water," Sauer said, meaning that crops will reach their wilting point faster during dry weather.

The researchers compared the soil beneath plots of prairie (with and without fertilization), continuous corn (with and without a rye cover crop) and a corn-soybean system. They found that prairie plots had eight to 12 times more roots than the corn plots in 2010. "We all know

BIOFUEL (cont. on page 11)

Training the next generation of fruit and vegetable growers

By MALCOLM ROBERTSON, Leopold Center program leader

Here's a challenge: how do you teach students to plan, manage, market and make money growing food crops, all during class time and within a growing season that extends beyond the typical school year?

That was the task for Horticulture Enterprise Management 465, a class developed two years ago in the ISU College of Agriculture and Life Sciences. Offered every semester, plus summer sessions, the three-credit senior-level course is listed in the departments of Horticulture and Agricultural Education and Studies. I am the instructor and have been working with faculty in both departments and at the ISU Horticulture Station north of Ames to create this new

curriculum.

The challenge was huge, just like the challenges faced by young people who want to enter agriculture. And nowhere are those challenges more prevalent than in Iowa, the country's top corn- and soybean-producing state.

Two of the key limiting barriers for new and beginning farmers would appear to be a direct result of the modern intensive corn and soybean production system found in the state.

1) First, farmland has become hard to acquire with its cost per acre rising almost exponentially since the mid-1980s (Figure 1 on page 6). This barrier emerged, in part, due to ag policy support, which

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LEOPOLD CENTER

LEOPOLD LETTER MISSION

The mission of the *Leopold Letter* is to inform diverse audiences about Leopold Center programs and activities; to encourage increased interest in and use of sustainable farming practices and market opportunities for sustainable products; and to stimulate public discussion about sustainable agriculture in Iowa and the nation.

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The Leopold Center for Sustainable Agriculture seeks to identify and reduce adverse socioeconomic and environmental impacts of farming practices, develop profitable farming systems that conserve natural resources, and create educational programs with the ISU Extension Service. It was founded by the 1987 Iowa Groundwater Protection Act. The *Leopold Letter* is available free from the Leopold Center at 209 Curtiss Hall, Iowa State University, Ames, Iowa 50011-1050; (515) 294-3711.



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News & Notes

The Leopold Center's 2012 Request for Pre-proposals resulted in 54 submissions in August. After review by staff and advisory board, 16 pre-proposals have been selected for development as one-year proposals. Full proposals are evaluated by staff, outside reviewers and members of the Leopold Center Advisory Board, with final funding decisions announced in late January 2013. The adjustment to one-year proposals will help the Leopold Center maintain a viable balance between new grants and multiple-year projects.

In August, the Leopold Center said good-bye to Karen Jacobson, the Center's administrative specialist for the past seven years. Jacobson was honored at a retirement reception at the ISU Memorial Union in Ames. Michele Rogers, accountant for the ISU College of Agriculture and Life Sciences, is providing interim accounting support for the Leopold Center.

A publication about what was learned from a Leopold Center-supported research project recently received a Blue Ribbon Award from the American Society of Agricultural and Biological Engineers. Laura Christianson and Matt Helmers were recognized for a four-page publication, *Woodchip Bioreactors for Nitrate in Agricultural Drainage*. Typically, only the best projects are nominated and about one nominee in five receives the Blue Ribbon designation. Helmers is a professor in ISU Agricultural and Biosystems Engineering; Christianson was a graduate student who evaluated pilot and field-scale bioreactors.

The Iowa Farm Energy Working Group has set up an online resource page called "One Stop Shop to Reduce Farm Energy Use." The web page includes links to resources developed by the working group since it began as part of a Leopold Center competitive grant from the Cross-Cutting Initiative. The resources include farm case studies, reports of energy demonstration grants and online videos. Other pages have information about grants and loans available from various state and federal programs; service providers of farm energy

audits; utility rebate programs for items such as farm lighting, heating/cooling and energy efficient equipment; and state and federal tax incentives and tax credits. Information about the group and a link to the One Stop Shop appear on the Leopold Center website at: <http://www.leopold.iastate.edu/farm-energy-working-group>

Drake University's Agricultural Law Center has developed two new publications as part of its Sustainable Agricultural Land Tenure (SALT) project supported by the Leopold Center Policy Initiative. *Landowners Helping New Farmers* provides an overview of state programs designed to help landowners who want to rent to a beginning farmer, and considerations that landowners might want to include in those leases. A second publication, *Rotational Grazing on Leased Land*, discusses what factors should be considered when setting up a lease for land that will be rotationally grazed. Both publications are on the Leopold Center's Pubs & Papers page, www.leopold.iastate.edu/pubs and at <http://SustainableFarmLease.org>

The Leopold Center Advisory Board elected new officers during their September meeting. Bill Ehm, who directs environmental services at the Iowa Department of Natural Resources, will be chair. Keith Summerville, an associate dean at Drake University, represents the Iowa Association of Independent Colleges and Universities on the board and will be vice-chair. Member-at-large will be Aaron Heley Lehman, a farmer near Polk City and board representative for the Iowa Farmers Union.

A new Leopold Center fact sheet, *Practices to Improve Water Quality*, provides a snapshot of 11 conservation practices that landowners can adopt to protect and improve Iowa's water quality. All conservation practices in the fact sheet have been the focus of recent Leopold Center research grants. Find the new resource by title on the Leopold Center's Pubs & Papers webpage: www.leopold.iastate.edu/pubs

Conversations

WITH DIRECTOR MARK RASMUSSEN

Taking note of the soil



In my travels across Iowa this summer, I had a chance to log a lot of gravel road miles. It gave me the opportunity to observe crop conditions as the drought wore on week after week. Being from Nebraska and having experience with dryland agriculture further west, this summer brought back many memories about farming where rain is most always in short supply.

I thought about how different this may seem in those parts of Iowa where “normal” usually means dealing with

too much water and underground drainage tiles are common. But after a summer like this, I suspect many Iowans may have a different perspective as they watched their crops with a worried eye, seeing the soil dry out and crack open like a wound.

In my travels, I also noted the wildly different conditions of crops from valley to valley, field to field and even on different slopes and locations within a field. Why should one part of a corn field curl up tight at midday, compared to corn in another

part of the same field? There are, of course, many factors at work that help explain these differences in crop condition. Crop varieties, cropping history, planting times and erratic rainfall were all part of the mix. Varying rainfall is especially frustrating to experience but typical of a prolonged drought, when your neighbor gets rain while your farm remains dry.

But the story goes deeper than just these factors. We all know that soil type and soil husbandry influence crop

growth and yield. “Husbandry” may seem like a term from a bygone era, but I can assure you that taking proper care of our soil is a contemporary concept that proved to be extremely relevant in a growing season like we experienced in 2012.

It’s important if not essential to “make every raindrop count” during years of scant rainfall and heat stress. Farming practices that accumulate organic matter in the soil to improve soil tilth, promote infiltration of water, minimize compaction and limit

runoff make a huge difference. As it was stated to me this summer: “When we have soils that cannot handle an inch of gentle rain without runoff, we have a problem.” I am confident that some of the differences in crop conditions I observed this past summer, and that may ultimately show up in yield increases at harvest, can be attributed to soil husbandry and farming practices.

As we bring in this year’s harvest and make plans for next year, we need to remember the soil and what it taught us this year. Soil husbandry matters and it should be part of everyone’s portfolio of best farming practices. We do not yet know if next year will be wet or dry, but the 2012 season was a lesson for all. No matter what the weather, healthy soils are an asset for all Iowans. Proper care of the land and healthy soil yield dividends, even when favorable weather does not make widely varying crop conditions obvious to the neighbors as they drive by on a gravel road.

Mark Rasmussen

Husbandry - The act or practice of cultivating crops and raising livestock; careful management or conservation of resources



Left: A welcome thunderstorm chased us all into a shed for my presentation at an August 7 field day at the ISU Neely-Kinyon Farm in southwest Iowa. Right: High-quality soils aid crop production under difficult conditions (Flickr photo by John Kelley).

Carbon cycling research fills gaps in knowledge

By MELISSA LAMBERTON, Leopold Center graduate research assistant

The Midwest's famous organic-rich soils have enormous potential to store carbon, protect cropland fertility and reduce the amount of carbon dioxide delivered to the atmosphere. Yet scientists still want to know more about how farming practices influence carbon movement.

A multidisciplinary project funded by NASA's Experimental Program to Stimulate Competitive Research (EPSCoR) seeks to fill that gap in knowledge. The project will develop models to quantify how carbon moves through a typical Midwestern midsize watershed in Iowa, with global implications in mind. The Leopold Center contributed special grant funding for a portion of the project.

"The U.S. Midwest due to its clay-rich soil has the greatest potential to sequester carbon—as long as the appropriate management practices are followed," said Thanos Papanicolaou of the University of Iowa's IIHR-Hydroscience & Engineering and Department of Civil and Environmental Engineering, the principal investigator for the project.

"We have a great opportunity here in the state and beyond to contribute not just to food production but also to carbon storage as well as other environmental services," Papanicolaou said.

Previous studies have estimated that conservation practices on farmland can keep nearly 33 megatons of carbon in the soil every year. But these studies have

treated the landscape as a static ecosystem, rather than a dynamic one, and often fail to properly account for interplays between human activities and nature. Questions remain about how crop respiration, soil respiration, and tillage-induced soil erosion and deposition contribute to carbon losses and gains to the atmosphere or local waterways.

Papanicolaou's team uses experimental plots in the Clear Creek watershed in eastern Iowa to explore the relationship between carbon and land management practices. The plots, 5 by 15 feet, mimic conventional corn-soybean agriculture, Conservation Reserve Program grass, and various management practices such as no-till and tilling at different times of the year. Researchers and students monitor each plot, measuring parameters such as crop height, crop yield, leaf litter, weather-related data and soil characteristics, as well as soil organic matter and carbon dioxide.

The Clear Creek data are utilized in two commonly used numerical models, WEPP and CENTURY. WEPP, which stands for the Water Erosion Prediction Project, models soil erosion rates under different scenarios, taking into account topography, soil characteristics, land management practices and climate. The researchers can look at single storm events or model the next 50 or 100 years. These results go into the CENTURY model, which predicts the redistribution of carbon in the watershed.

To validate the results, researchers

compare the data from the coupled models with on-the-ground measurements collected from different locations in the Clear Creek watershed.

Together the models show the patterns of carbon loss due to soil movement in a typical corn-soybean system at the landscape scale and over long periods of time. The research will lead to suggested scenarios for mitigating carbon loss. Other researchers have applied similar modeling work to forests and grasslands, but little attention has been paid to agricultural fields. The researchers hope these models will help lead to sound policy decisions about land management.

"We need to maintain carbon in the soils if we really are striving toward a sustainable environment," Papanicolaou said.

The Leopold Center has two new On the Ground videos about this project.

The project team includes collaborators from the University of Iowa, University of Northern Iowa, Iowa State University, U.S. Department of Agriculture and NASA. Investigators include University of Iowa Ph.D. students Ken Wacha and Ben Abban, and Dimitrios Dermisis, a former Iowa student and currently a faculty member at McNeese State University.

 www.leopold.iastate.edu

Watch two new videos:
www.leopold.iastate.edu/news/on-the-ground/carbon-movement-iowa-landscapes



Thanos Papanicolaou (center), principal investigator of the project, poses with team members at the Clear Creek experimental site. Photo credit: Jackie Stoltze



Anticipating the future?

Sustainability is about maintaining something—about keeping something going—indefinitely into the future. History does not give humans very high marks for our ability to predict, let alone control, the future.

Our best bet for achieving sustainability probably is rooted in our efforts to anticipate changes and prepare for them in advance. How we are positioning ourselves, especially with respect to food and agricultural sustainability, provides us with ample material for interesting debates.

Paul Krugman made a provocative observation in a column published July 1, 2012 in the *New York Times* (Krugman 2012). He said that in 1910 Norman Angell argued quite persuasively in a popular book, *The Great Illusion*, that wars were obsolete since the cost of military conquest no longer could be justified given that trade and industry, (not the subjugation of people), had become key to national wealth. Simply counting the number of wars we have waged since 1910 shows us how that turned out! More importantly, we seem to have turned wars into a type of disaster capitalism in which we justify military spending as a means of “stimulating the economy.”

As we anticipate changes in our future food and agriculture systems, we may confront similar delusions. For example, we know that most of our natural resources are in a state of decline. Fossil energy, which powers every aspect of our food system from seed to chemicals, fertilizer, mechanization, processing and transportation, is being depleted. The same is true for minerals, especially rock phosphate and potash that are inputs for our current industrial food system, and iron ore and copper metals that are essential for mechanization. We also are using more than 70 percent of the planet's freshwater resources for agricultural irrigation. Some predict that the Ogallala aquifer will be depleted in another 20 years (Hylton 2012). Add the projected reduction in yields due to increased frequency of severe weather events as a result of climate change, and the prospects for “maintaining” productivity of our current industrial food system are dim (Lobell et al 2011).

How should we proceed?

One option is to persist with our demonstrated capacity to use destructive capitalism to achieve short-term economic gains. Michael Klare imagines a chilling scenario in his new book, *The Race for What's Left*. He paints a plausible picture of a future in which we will increasingly engage in violent geopolitical scuffles to lay claim to the world's last resources. Given that many nations already are positioning themselves to engage in such conflicts, it is not hard to imagine going down this foreboding path.

Klare proposes that we can adapt to the new world only “through a complete transformation of industrial society” and that it is critical to begin with food and agriculture. While we all probably can manage without a lot of industrial technology, we cannot survive without food and water.

Such a transition appears reasonable, bringing us back to Angell's proposition in 1910. Using his logic, we could argue that given the imminent depletion of our natural resources, the industrial economy will become obsolete. Hence, a complete transformation of industrial society will occur naturally.

So what would be the next steps?

First, those involved in food and agriculture need to engage in conversations. Given our future world, can simply intensifying what has worked in the past sustain us? If not, what are the alternatives?

Second, let's reacquaint ourselves with wisdom embedded in the writings of Sir Albert Howard, Aldo Leopold and Liberty Hyde Bailey, as well as some non-western cultures (National Geographic 2012). These luminaries saw the wrongheadedness in industrializing agriculture, and they proposed alternatives. We might marry that wisdom with the emerging science of ecology and evolutionary biology to create a transformed agriculture for the future.

Third, we only can accomplish this task through global cooperation and sharing, not through a race for what's left.

Fourth, we need to become more explicit about what the market economy does in our current industrial society and what it creatively *could* do. We might look to inventive economists like Michael Porter and Mark Kramer who have proposed a new business model based on what they have called “Creating Shared Value” (Porter et al 2011). Economies based on partnership and cooperation likely will serve us better during this transition than economies based solely on competition and domination.

The good news is that already numerous “beacons” point to a revamped food and agriculture system, and a new generation of young farmers are eager to participate. This new food system celebrates the intersection of biological, cultural and economic diversity, potentially increasing the resilience of natural, social and economic systems. It is based mostly on self-renewing and self-regulating, adaptive systems designed to mimic nature, rather than systems that rely on energy-intensive external inputs that dominate nature. The “beacons,” featured in numerous United Nations studies published in the last decade, include innovations in perennialization, permaculture, agroforestry and diversified crop/livestock systems.

It is important to remember that transformations never take place overnight. Change happens in a series of successions in which we sort out what works in each landscape. Almost certainly, restoring the biological health of our soils and the biological and genetic diversity of our plants and animals will be foundational to such a transformation.

We all certainly can benefit from a new ethical culture in our communities based on what Aldo Leopold called an “ecological conscience.”

References available on the Leopold Center website

2012 drought: A glimpse at its impact and lessons

Some natural disasters happen in an instant. A tornado rips through a farmstead, the clouds clear and you can assess the damage. Others are painfully slow, invisible and widespread, their impacts felt for months and even years.

That's what Iowans experienced after the hottest July since 1936 and drought conditions throughout the state moved from "severe" to "extreme" to "exceptional." Crops withered and died. Livestock numbers fell. Federal disaster assistance was offered to farmers in more than 1,800 counties in 38 states.

Drought affects farmers in countless ways, yet conditions may vary from one farm to another, from one day to the next. Rather than a big-picture view, we offer a perspective from those closest to the land, those who have had to watch, worry and wait through the season.

Leopold Center graduate research assistant Melissa Lamberton talked with these farmers. She asked them how the drought has affected them, and if they could, what they would change in their operations next year. Some comments have been shortened for print here, but you'll find a longer version on our website: www.leopold.iastate.edu/news/leopold-letter/2012/Fall

Sally Gran, TableTop Farm

THE FARM: TableTop Farm is a Community Supported Agriculture (CSA) operation near Nevada, in its second-year transition to organic. It is owned and operated by two families, Sally and Luke Gran and Chris and Kim Corbin. They grow 15 acres of vegetables.

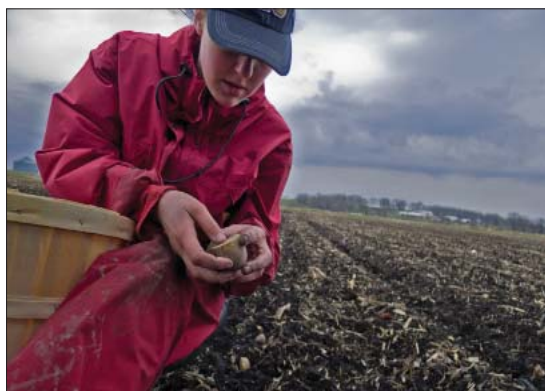
THE DROUGHT: "We've been really lucky, but it's been expensive. We've spent several thousand dollars setting up and maintaining irrigation. A number of crops were lower quality than they would have been. Early in the season the lettuce was weak and couldn't defend itself so all the pests descended on it. We were irrigating around the clock. You'd feel under the black plastic mulch and it would still be dry, even though it seemed like we were dumping water into it. There were some positive effects. We haven't had as much disease in our tomatoes; the melons have tasted great. We also haven't had as much anxiety about drift from aerial application of pesticides, because fungal disease has not been as great of a threat for row-crop farmers."

THE FUTURE: "We've been thinking about some sort of backup plan for irrigation, for when the creek runs dry. We've realized how important it is to have money saved up for things like this. It makes us appreciate our CSA model even more, because of the insurance it provides. Our members pay before the season starts, regardless of what the weather does. That prevents us from going under financially."

Jerry Peckumn, Peckumn Farm

THE FARM: Jerry Peckumn and his son Tom run a conventional corn-soybean operation in the Raccoon River watershed on about 2,000 acres.

THE DROUGHT: "We were concerned early about the low soil moisture so we applied most of our nitrogen fertilizer at



Sally Gran (photo by Dennis Chamberlin)

planting—we normally apply in June—to make sure it moved into the root zone. That turned out to be a good decision. We had a cover crop. We may have left it alive too long using up moisture we could have used later so next year would terminate in very early spring if it stays dry. We decided not to buy cattle as it got drier. We're going to have a very short crop, maybe half, I'm not sure. We will be careful with fall tillage."

THE FUTURE: "You can't predict what the weather's going to be. We have very little subsoil moisture. We'll do everything we can to conserve the subsoil moisture we have. We probably won't really alter our farming operations [in response to the drought]. The farm plan has to be based on longer-term weather averages. We won't want to have any weeds growing. We may try cover crops on a limited experimental basis only. We may look at planting more soybeans of later maturity because they tend to need less water early in the season."

Dan Specht, Prairie Quest Farms

THE FARM: Dan produces grass-finished beef on 700 acres of pasture, forest and row crops in northeast Iowa.

THE DROUGHT: "In some ways recently I've had the best grazing year I've ever had. Because of the warm March weather, the grazing season started a whole month early. My soils, especially on the

ridge top, have good water-holding capacity and alfalfa crops have been productive this year. I don't grow too many row crops so I haven't suffered like most of my neighbors. On the side hills soils can get pretty thin with shallow and exposed bedrock. Soils in those places did burn up. So far I've missed the worst of it. If you look at the rainfall on the map, some of those rains I got in July only covered one pixel on the screen."

THE FUTURE: "We're looking at going into the winter with soil moisture all depleted. It will be a challenge next year unless we get good recharge. I was farming during some dry years in '88 and '89, and '89 was the year that the springs dried up and you could see exactly where the cracks were in the bedrock because that's the only place there was a green strip in the hayfield. So I'm worried about next year a lot more than this year. I'm just an observer but I think grazing is less risky, and more resilient, with more options for reacting to drought."



Dan Specht, on right, with friends (photo by Practical Farmers of Iowa)

Rick Juchems, Butler/ Bremer County

THE FARM: Rick has a corn-soybean rotation in northeast Butler and northwest Bremer counties. He also has 2,400 head of hogs and 2,000 head of cattle.

THE DROUGHT: "I farm some sandier soil or lighter soil and they've been burned up since the first part of August. The areas just keep spreading, getting bigger and browner. The soybeans have hung in better; they seem to be more drought-tolerant. We have federal crop insurance. Just feeling like you can't do anything—you work hard, and you can smell it at night, corn is just burning up. It never cools off at night. It's hard looking at it and thinking, this could've been a pretty good year and now hopefully we'll just be able to make payments."

THE FUTURE: "My no-till hung in there much longer than minimum-till. I use minimum-till because I put hog manure down in the fall and level it off in spring with a field cultivator. Without the cover to keep the moisture in, the drought effects showed up a lot faster. Cover seemed to keep the moisture in and the temperature down. I know for sure next year I won't do any corn-on-corn. It's all going to be in rotation. I think it's supposed to be dry again next year. It's probably the worst drought I've experienced. It's amazing that the corn crop is doing as well as it's done. I think the genetics that are out there now survive a lot better than even just ten years ago."

Linda Grice, Grice Family Farms

THE FARM: Linda Grice rents her farm in southwest Iowa. She has organic and non-organic row crops and rotationally grazed beef cattle.

THE DROUGHT: "It started off to be the best crop ever, and all of a sudden it got too dry. Now it's better than some places, but it's not good. There wasn't really anything you could do at all."

THE FUTURE: "I've already talked to my tenant and they're going to put rye cover crops on this fall as soon as the crops are out, and I think that will help hold moisture and increase organic matter. Actually I made the change earlier because



Rick Juchems and his daughter Liz

the tenants had tilled more than I was happy with; I had talked to them about this. We're going to have cover crops and we're going to be no-till."

Tom Wagner, O'Brien County

THE FARM: Tom and Jim Wagner grow corn and soybeans and have a hog finishing operation. They farm 1,800 acres in O'Brien County.

THE DROUGHT: "Obviously we're going to have fewer crops to harvest than we've had the last few years, but we're fortunate. Most of our farming operation did get full recharge here this spring, as far as our subsoil moisture goes. That's helped us a lot. We've had a couple of timely rains in June and July. We have a better crop in northwest Iowa where we're at than anywhere between here and Des Moines. Just the amount of heat we've had alone will be adverse to our yields."

THE FUTURE: "We feel our no-till has helped us quite a bit, kept our crops greener a little longer; we conserved as much moisture as we could early on. So we'll stay the course there. We'll be short of moisture next spring unless the weather changes a bunch. We're doing as much as we can to save moisture. We've got to be optimistic."



Jennifer Steffen, Steffen Family Farm

THE FARM: Jennifer Steffen owns part of a larger family farming operation in Van Buren County.

Her sons Ben and Spencer grow corn, soybeans and hay, and have 120 head of purebred Angus cattle in a cow-calf herd.

THE DROUGHT: "It's been a big worry for feedstuff for the winter. They've got paddock systems and have been rotating the cows as often as they can, but they're very short on pasture. The pastures are not over stocked so they haven't had to reduce the herd, so they're better off than a lot of folks down in the area. The row crops are really, really poor this year, corn especially. The beans have benefited from late rains but the corn—it's running anywhere from

20 to 180 bushels per acre, depending on where it is on the landscape. Lots of mature trees are suffering. A number of them are dying in our area—white oak, sugar maple, even locust trees. It's ugly—everything desiccated, just dry, no rain for months."

THE FUTURE: "It's been a long time since we've had a drought of this intensity. The boys are probably going to seed more end rows with meadow so they've got a buffer zone and the ability to use it for cattle feed. They might consider more intense management of their pasture. It would be better to have the pasture split into more paddocks—that would involve building fence but I think they would consider that in the future. I think their crops also have benefited because it's been 100 percent no-till since 1980 and water has been able to percolate down. A layer of humus on top kept the soil from drying out as early as neighbors' maximum tillage acres. We feel we've weathered the drought as well as we could hope for."

Maury Wills, Wills Family Orchard

THE FARM: The Wills Family Orchard is 60 acres in Dallas County, with four acres in apple trees and a three-acre pumpkin patch. The farm was certified organic in 2000 and includes an on-farm store.

THE DROUGHT: "The biggest impact we had, that we know of so far, was the freeze we had in early April, where we lost all of our apples. It would be easier to see what the drought has done if we had apples going into it, but we didn't. Some of our newly planted trees have died. We had to water, and there was a period of time when we didn't get that done. We lost some mature trees as well, probably four or five of the Chieftain variety. We decided to irrigate pumpkins this year—we weren't planning on it, and had to go through the expense of putting in another hydrant, but we got a great pumpkin crop."

THE FUTURE: "The trees that were the most heavily mulched with woodchips really did quite well, and the trees without mulch seemed to not do as well. That's most pertinent to our dwarf varieties, which aren't rooted as deeply. If we know we're going into a drought again, we'll make sure that we mulch all those dwarf trees adequately. Another thing I would do is drip irrigation on the dwarf trees."



NEW CLASS TEACHES STUDENTS BUSINESS MANAGEMENT SKILLS

STUDENTS (continued from page 1)

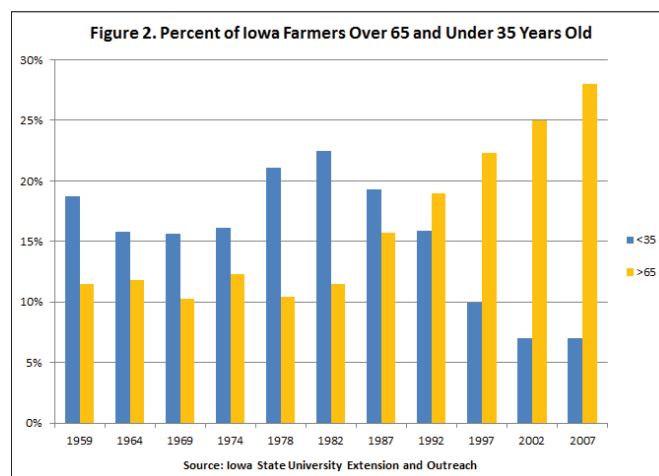
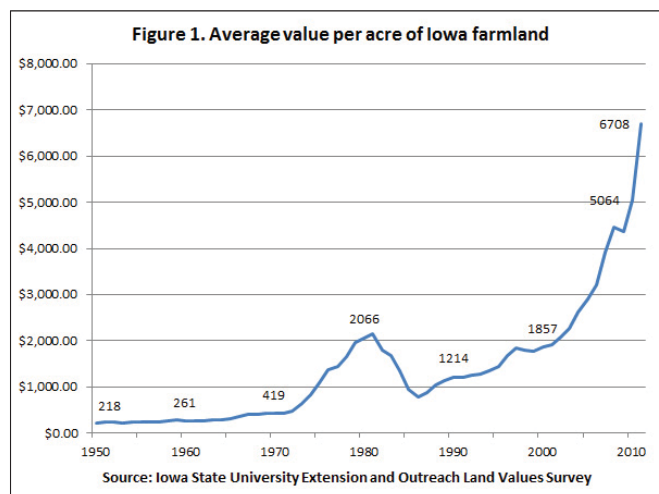
has greatly incentivized the production of corn and soybeans by supporting research for those crops and helping farmers manage production risks. One way to deal with this barrier is to grow fruit and vegetables, which require less land and have lower startup costs and capital outlay than traditional corn and soybean operations. Consumer demand for regionally grown produce also has increased in recent years so there is a ready market.

2) The second barrier often relates to demographics of the farming population. According to the most recent Census of Agriculture done in 2007, the average age of an Iowa farmer is 56, which has increased from 47 in the last 20 years. During that same period, the percentage of farmers over age 65 went up while the number of farmers under 35 fell (Figure 2). Generally the older we get, the less likely we are to take risks, so older growers probably are less willing to diversify from traditional crops into fruit and vegetable production, so the industry is wide open for young, beginning farmers. We certainly need more, younger growers in Iowa who are willing to take risks on new ventures.

The class focuses on management and operation of diversified horticultural enterprises in an Iowa farm situation. The intention of the course is that the students manage the finances and decide what crops to grow on their plot of land at the ISU Horticulture Station north of Ames. They also plant and tend those crops, and find markets for their harvest.

The course is structured as a business, and ultimately will be guided by the decisions made by five student committees: finance, operations, production, marketing and business. The aim is that each committee investigates the feasibility of a desired enterprise according to the demands of their respective areas before coming together under the direction of the business committee to make a final decision.

AgEdS/Hort 465 is a senior-level capstone course with non-major graduate-level credit allowed. Students attend classroom lectures on business and market planning which include basic risk management, financial management and decision-making for short-, medium- and long-term viability of the AgEdS/Hort 465 enterprises. Class discussions and activities help them apply what they've learned from other courses and give them a critical learning **STUDENTS** (cont. on page 8)



Class members pose by a water tank (from left): Dylan Rolfe, Holden Nyhus, Benjamin Metcalf and Laura Kleiman.

What we learned in 2011

Mini tunnel: The class had access to a mini-tunnel at the Horticulture Station for an early season crop of tomatoes. Bed preparation, which included laying black plastic mulch and sub-surface drip irrigation, occurred in early April and seedlings were planted in mid-April. Row covers were used initially to protect the crop from late frost and enhance early growing conditions. Crop harvest continued into late July and early August.

Field production: The spring 2011 class selected four crops for summer production: one-quarter acre of onions (sets and direct seeded), one-quarter acre of watermelons, one-eighth acre of tomatoes and one-eighth acre of potatoes. Late spring rains delayed land preparation and planting operations. Cornstalk mulch between rows promoted long-term soil health, and reduced weed pressure and the need for chemical inputs. Due to the delayed arrival of a system to apply nutrients and chemicals, no applications were done on any of the crops. Irrigation scheduling was determined through the use of tensiometers positioned for each crop.

STUDENTS (continued from page 7)

experience in a real-life, practical setting. The importance of communication and planning are emphasized throughout the semester.

During its second year in 2012, AgEdS/Hort 465 continued to develop as a unique, on-farm laboratory for students. Most of the produce was sold to Iowa State University Dining Services, as well as a local restaurant and retail store. We have not reached a “critical mass” yet as far as student numbers, but the outlook is good due to a 100 percent increase in enrollment during 2012.

Here’s the ISU catalog description, which also serves as the class mission statement:

On-farm learning gives students hands-on experience in horticultural enterprise planning (business plan development, budgeting, crop scheduling, record keeping and marketing); crop production (crop nutrition, crop protection, food safety and postharvest handling); and, practical implementation of the decisions made by the class.

It is critical that we start looking for ways to address the barriers that inhibit the young farmer from getting onto the land. In an attempt to produce a new generation of young farmers, AgEdS/Hort 465 course is deeply focused on developing a well-grounded program and providing practical experience from the first to the last step involved in running a horticultural production enterprise.



What do students think?

Kevin Sullivan, a senior in horticulture, (above, with microphone) had never grown crops in anything larger than his parents’ garden in Cedar Rapids. But he wasn’t discouraged by last summer’s drought, which posed unique problems with many of their crops.

“You get hardships wherever you go,” he said, explaining how mice ate the first planting of watermelon seeds, heat stress slowed tomato bloom and then wind caused considerably breakage later in the season.

Sullivan and senior classmate Kyle

Tester (above left, in straw hat) shared their experiences during a field day at the Horticulture Station in late July. The presentation gave them an opportunity to evaluate what they had learned over the summer.

“Unlike my other classes where you learn how things grow, here we actually do it,” Tester said. “This course is about what we can learn from our mistakes. It’s been great to learn these lessons in a business, knowing that it’s not your own money but it could be.”

What we learned in 2012

High tunnel construction: One of the highlights was construction of the AgEdS/Hort 465 high tunnel. With the help of the horticultural farm, the summer class erected its own high tunnel, thus creating the opportunity for the class to produce early and late season crops for the local market. Fall 2012 will see the first crops in the tunnel: cauliflower, spinach and mesclun greens.

Field production: The class used similar cultivation practices as the previous year but they planted peppers instead of potatoes. They also planted the class’ first perennial crop, asparagus, in a small plot adjacent to the main production land.



Above left: Kevin Sullivan and Leah Riesselman adjust the tarp on the high tunnel that they helped construct. Above right: Benjamin Metcalf oversees onion transplanting by Laura Kleiman and Holden Nyhus.

Iowa welcomes Rasmussen 'back home'

Iowa's sustainable ag community welcomed the Leopold Center's fourth and newest director at a reception on September 6. The event was in addition to meetings that Mark Rasmussen has participated in throughout the state and on campus since he began work June 1. He has met with leaders of farm and conservation organizations, members of the Leopold Center Advisory Board and university administrators and attended numerous field days to acquaint himself with Iowa agriculture.

Advisory board chair Bill Ehm said he likes Rasmussen's "practical approach to agriculture." Both Ehm and Rasmussen have been full-time farmers: Ehm in southern Iowa and Rasmussen in northeast Nebraska.

"I knew I'd like him from the start – he knew what it was like to have dirt and grass under his fingernails," said Ehm, who now directs environmental services for the Iowa Department of Natural Resources.

When he was farming in the 1980s, Ehm said he always looked to the Leopold Center as "a place to find different ways to approach agriculture," a role even more important for the center today.

Fred Kirschenmann, former director and now Leopold Center Distinguished Fellow, said he could relate to Rasmussen-the-farmer as well as Rasmussen-the-leader.

"I am convinced he has the vision we need at this point to face the incredible new challenges that will change the way we do things, something that at the Leopold Center we call resilience," said Kirschenmann, who also oversees his family's farm in North Dakota.

Joe Colletti, senior associate dean in the ISU College of Agriculture and Life Sciences, said Rasmussen not only brings farming experience to the job, but also a successful scientific career and skills for working with government and technology transfer.

Rasmussen said he was glad to be in



Rasmussen (left) joins his predecessors: Fred Kirschenmann (center) served as director from 2000 to 2005; and Dennis Keeney, the Center's first director, now Senior Fellow at the Institute for Agriculture and Trade Policy. The Center's third director, Jerry DeWitt, retired in 2010 and lives in North Carolina.

Ames where he spent 18 years at the National Animal Disease Center. "Iowa State always was the center of the universe as far as agriculture was concerned," he said, noting the connection his family had with ISU for livestock information.

Local food coordinator brings enthusiasm, experience

From starting a meal program for homeless and low-income families to working with school gardens, women farmers and a food cooperative, Lynn Heuss brings a lifetime of food systems experience to her new job affiliated with the Leopold Center.

Heuss is assistant coordinator of the statewide Local Food and Farm Initiative (LFFI) program, led by Craig Chase who also directs the Leopold Center's Marketing and Food Systems Initiative. She began work July 1 on a part-time appointment.

"My job here is to work on partnership development with the many different components that make up the local food system—corporations, producers, consumer groups, educational

institutions—so we can work together to put more local food on more Iowa plates," Heuss said.



Lynn Heuss and one of her laying hens

All local food efforts—at the Leopold Center, the statewide LFFI program now in its second year, and Iowa State University Extension—have been united under one umbrella. Chase and Heuss are working with the Regional Food Systems Working Group, which brings together 17 different local food organizations throughout the state. They also are working with a new Iowa Food Systems Working Group, made up of educators and specialists within ISU Extension who are developing programs and resources.

Heuss will prepare program reports, write grants and help with communication among the various groups. She also is

planning a two-day conference in March 2013.

Her connection with food security began in 2003, when she started Connection Café serving free meals in downtown Des Moines. Under her direction, the program expanded from initially offering meals three days a week to five days a week, providing food and other types of resources for more than 200 people.

Other past positions include development director at the Iowa Food Cooperative, working with beginning farmers in the Buy Fresh Buy Local chapter in Des Moines and as a resource for Midwest farm-to-school programs. She has an undergraduate degree in religion from Grandview College in Des Moines and has studied theology at Notre Dame.

She also is enrolled in the public policy master's degree program at Iowa State and is a program coordinator for Women, Food and Agriculture Network. The WFAN program shares conservation resources with women landowners and connects them with women who want to start their own farming operation.

BUILDING HEALTHY SOIL WITH A BIOFUEL CROP

BIOFUEL (continued from page 1)

that prairies have lots of roots, but we were slack-jawed at these numbers,” Sauer said. Researchers calculated that 40 to 55 percent of the prairie total biomass occurred belowground, compared to only 3 percent for corn.

“There are profound implications of having all that organic material in the ground,” Sauer said.

Deep-rooted prairie plants create healthier soil: rich in organic matter, with plenty of aeration, good infiltration, stable structure and active nutrient cycling. In addition to optimizing plant growth, these organic-rich soils hold more water, creating a reservoir that plants can draw on during drought. Sauer envisions that prairies might be grown alone or in rotation with row crops so that farmers can take advantage of this benefit.

Prairies also improve water quality by reducing the movement of sediment, nitrate and other pollutants. In 2010, COBS researchers found that when compared to the corn-soybean system, the fertilized prairie plot released 97 percent less nitrate to tile drainage. By reducing nitrate loading to streams and rivers, farmers can protect the health and economies of communities downstream.

Questions remain about whether prairies will produce enough cellulosic biofuel feedstock to compete with grain-based ethanol. Initial results from the COBS experiment look promising. Researchers estimate that a prairie managed with early-spring nitrogen fertilization will produce amounts of energy comparable to the corn-soybean system, although less than the continuous corn system.

“These prairie systems will hopefully

demonstrate the importance of restoring native organic matter,” Sauer said.

The Leopold Center funded this project through a 2008 competitive grant in the Ecology Initiative. The COBS program has been funded by ISU College of Agriculture and Life Sciences, Plant Sciences Institute

and Biobased Industry Center, Conoco Philips and the U.S. Department of Agriculture.

Learn more at www.leopold.iastate.edu/grants/e2009-18

Cover crops getting a second look

Another Leopold Center research effort is providing valuable information as Iowa farmers respond to the drought. Fall-planted cover crops can reduce leaching of unused nutrients left in the soil after the dry, heat-stressed growing season. A cover crop also can help retain winter moisture and lead to long-term improvements in soil quality.

“This is a good opportunity to learn about cover crops so that the next time this happens, a farmer is ready for it,” said Tom Kaspar, soil scientist at the ARS-National Laboratory for Agriculture and the Environment in Ames. He works with the Iowa Cover Crops Working Group and the Midwest Cover Crops Council.

“We are telling farmers to start small,

as with any new practice, and learn as they go. We always have nutrients left in the soil after harvest, but this year there are more nutrients than normal,” Kaspar said.

The Iowa Department of Agriculture and Land Stewardship will allow farmers to apply for cost-share dollars for fall-seeded cover crops. The emergency rule change includes cover crops as an eligible practice under the Iowa Financial Incentives Program (IFIP), administered by local soil and water conservation districts. Surveys show that only about 10 percent of Iowa farmers are using cover crops.

Depending on weather conditions, the latest planting date for cereal rye ranges from October 22 in northwest Iowa to November 14 in southeast Iowa. Seed has been more costly and difficult to find this year, due to increased demand and expanded corn production in North Dakota and South Dakota that supply small grains.

Cover crops reduce erosion and improve soil quality by increasing organic matter. Among the barriers to using cover crops are cost, the narrow window for fall planting, and how they could interfere with spring planting.

Learn more at www.leopold.iastate.edu/iowa-cover-crops-working-group



New guide reviews Iowa food marketing rules

Farmers who want to sell food products have a new resource to help them navigate the maze of rules and regulations.

Iowa Food Marketing Regulations: A Guide for Small-Scale Producers is now available on the Leopold Center website. It covers sales of locally raised fruit, vegetables, meat, poultry, honey, eggs and dairy products.

The guide summarizes various licenses required to sell food in Iowa and state regulations that govern those sales. The rules are based on type of food, where it is sold, how it is processed, scale of operation and type of customer. The guide also

directs readers to the appropriate agency or official who can answer specific questions about an operation or how to begin the process of obtaining each license.

“We receive many questions about food marketing rules and regulations, which are quite detailed and sometimes can be confusing,” said Craig Chase, who directs local food programs for the Leopold Center, Iowa State University Extension and the statewide Local Food and Farm Initiative. “This is by no means a substitute for legal advice, but it should help direct people to the appropriate departments and agencies for further discussions.”

The guide was developed over the past

year and compiled by Tufts University graduate student Joanna Hamilton, a 2011 intern at the Leopold Center. All information was reviewed by a team of people who work with small-scale producers as well as officials that administer food marketing regulations in the Iowa Department of Inspections and Appeals and Iowa Department of Agriculture and Land Stewardship. The guide is modeled after similar resources available in Wisconsin and Minnesota.

Download the guide at www.leopold.iastate.edu/pubs-and-papers/2012-09-iowa-food-marketing-regulations



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www.leopold.iastate.edu/news/calendar

Learn about how to get support for events: www.leopold.iastate.edu/grants/education

Pesek Colloquium

Ecologist Erle Ellis from the University of Maryland will present the 2012 Pesek Colloquium on Sustainable Agriculture October 29 at the ISU Memorial Union in Ames. Ellis will offer his ideas for a new approach to human impacts on the environment. The lecture is hosted by the ISU Wallace Chair for Sustainable Agriculture.

Iowa Organic Conference

The Leopold Center is a co-sponsor for this event November 18-19 in Iowa City. Other co-sponsors include ISU, the University of Iowa Office of Sustainability and New Pioneer Food Cooperative. Keynote speakers are Will Allen who founded Growing Power for urban agriculture, and Leopold Center Distinguished Fellow Fred Kirschenmann.

Value Added Agriculture

Leopold Center advisory board member Laura Jackson will be a keynote speaker at the 14th Annual Midwest Value Added Agriculture Conference December 12-13 in LaCrosse, Wisconsin. The event brings together small-scale farmers, educators and others from Iowa, Illinois, Minnesota and Wisconsin. The event is supported by a Leopold Center Competitive Educational Support Program (CESP) grant

Cover Crop Conference

The Iowa Cover Crops Working Group is helping to plan a workshop December 13-14 in Altoona, "Cover Crops: Practical Strategies for Your Farm." The goal is to help farmers learn how to effectively manage cover crops to enhance soil quality, keep nutrients in the fields, and increase the bottom line.



Happy partners

Advisors for the Landscape Biomass Research Team pose during a July 30 field day at the Uthe Farm near Luther. The Leopold Center supports this work comparing five potential cropping systems to produce biofuel feedstock. Partners are (left to right): Theo Gunther, Soil and Water Conservation Society; Doug Davenport, NRCS district conservationist; and farmers Craig Fleishman of Minburn, Rick Juchems of Plainfield, Rob Stout of Washington and Larry Pohlman of Nevada (Hertz Farm Management).